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## REVIEWS

**Harshberger's Phytogeographic Survey of North America\***

This long expected work on North American plant geography by Professor Harshberger has at last appeared under date of 1911. The writer has divided his work into four parts, and for purposes of review, it will be convenient to consider these divisions in their proper order; reserving for the end some general conclusions.

I. HISTORY AND LITERATURE OF THE BOTANIC WORKS AND EXPLORATIONS OF THE NORTH AMERICAN CONTINENT. To this historical first chapter (pp. 1-39), dealing with the rise and development of North American floristic botany, much might still be added, and then one would continue to feel the inadequacy of the treatment. For instance, the failure to mention Fernald's work in the Gaspé peninsula (p. 4), Rydberg's on the Canadian Rockies (p. 5), or of Hollick's explorations in Alaska (p. 7) all leave something to be desired in an essay on the history of Canadian and northern botany. Coming down to New England, a fairly comprehensive survey of botanical activity in that section is given, stretching from John Josselyn's "New England Rarities," 1672, to the work of Robinson and Fernald, of our own times. In a book the preface of which is dated October, 1910, one would have hoped to find some mention of the recent admirable catalog of Connecticut plants, issued early in 1910, by the Connecticut Botanical Club, but the author does not seem to have known of it, or perhaps not soon enough to get it into his work.

It is in covering the Middle Atlantic States that we should expect the historical portion of this work to be the most precise and of greatest value, as it is here that the records of over a hundred years are rich and varied. Tracing the early period of Green, LeConte, Hosack, and Torrey down to the mid-nineteenth

\* Harshberger, J. W. *Phytogeographic Survey of North America*. A consideration of the phytogeography of the North American continent, including Mexico, Central America and the West Indies, together with the evolution of North American plant distribution. Pp. i-lxiii + 1-790. Pl. I-XVIII + f. 1-32, and colored map. William Engelmann, Leipzig, and G. E. Stechert, New York. Price, unbound, \$13.00. [Vol. XIII. *Die Vegetation der Erde*, A. Engler and O. Drude.]

century, the writer then takes up more recent developments. No mention is made of the very intimate relations between the Torrey Club and the New York Botanical Garden (not "Botanic Museum"), and of the fact that the president of the former must *ipso facto* be on the board of managers of the latter. That the Bronx Garden owes its very existence to a movement started in the Club many years ago is a well known piece of historical gossip. His treatment of the Garden itself and of the Club also, is somewhat inadequate, as no mention is made of the work of Murrill, or Hollick, at the former; and it were pertinent to remind the writer that there have been two editors of the *Bulletin* since Dr. Barnhart resigned some years ago as editor-in-chief of the Club. Of a more serious nature is the omission of any mention of the comparatively important floras of Utica, by Harberer, and of Troy, by Wright and another by Eaton; and the inclusion of the inconsequential little pamphlet on the flora of Central Park, New York City, by E. A. Day! Similarly, the failure to mention the work of Stewardson Brown and Miss Keller, on the flora of the vicinity of Philadelphia, is somewhat surprising.

E. L. Greene's work on the flora of the Rocky Mountains, and Nelson's recent book on that subject (p. 23), are also ignored. Again, Rydberg, in his flora of Montana and the Yellowstone does something more than "give an account of the herbaria consulted, the botanists engaged in field work, and the localities visited." This information is confined to the preface, whereas in the body of the work are such data as a catalog of the plants, with stations cited, together with habitats, altitudinal distribution, etc. Notwithstanding editorial curtailment of space, we should have expected to see mention, at least causally, of the work of LeRoy Abrams in California, of Transeau, Shreve, Cannon and Lloyd in Arizona, and of Von Turckheim and perhaps Wercklé in Central America.

It must not be inferred from this catalog of things and names omitted from the history that the work is not without much value, for it is something to have brought together the imposing array of facts and names that Dr. Harshberger has accumulated

and there is presented a fairly comprehensive history of floristic botany in this country so far as its broad outlines are concerned.

A rather meager account of the history of plant geography, physiography, altitudinal distribution, and phenology is perhaps to be accounted for. These subjects lend themselves to historical treatment with difficulty, and the obvious scantiness of the data must be accepted as an excuse for the all too brief record (7 pages) that the author has set down.

There follows then, in chapter two (pp. 45-92), a bibliography of North American Botany, separated into (*a*) general works, and (*b*) special works on the territories; the latter under the eight sectional divisions into which Dr. Harshberger has divided the continent. Each of these parts of the bibliography is alphabetic-chronologic in arrangement, and it is the latter feature of the lists that attracts instant attention. All, or nearly all, the important works are listed up to 1908; from then onwards one finds nothing. The bringing of a bibliography only up to within nearly three years of the date of publication is open to some question, at least, as to timeliness; but the failure to list later and more complete editions of old works is positively misleading to the seeker after bibliographic facts, who has reason to expect approximate completeness, at least up to 1908. A case well illustrating this is the citation, both in the bibliography and throughout the rest of the book, of Gannett's Dictionary of Altitudes of the United States as Bulletin 160 of the U. S. Geological Survey, 1899, when a new edition, nearly twice as large, was published in 1906 as bulletin 274 of the same series.

Many minor inaccuracies are to be found, such as the date of Grisebach's Flora of the British West Indies. It is given as 1864, when it is a well known fact that the work appeared in six parts, five of which were issued before the close of 1861. Of the forms of citation used here and throughout the body of the work, it may be said that it is usually fairly clear just what is referred to, and this in spite of the fact that sometimes the forms used in zoölogical literature are adopted, sometimes other forms, presumably the author's, but almost never the form of citation adopted at the Madison meeting of the A. A. A. S., section G,

1893, which has received practically universal acceptance among American botanists. The bibliography, as a whole, however, will be invaluable to future students, in that it brings together, in one place, and for the first time, most of the important books and articles that have been printed, thereby making it possible to get bibliographic information on any given subject almost at a glance.

II. GEOGRAPHIC, CLIMATIC AND FLORISTIC SURVEY. The first chapter of this part is a brief (pp. 93-130) geographical description of the continent and need not detain us, as it is necessarily a compilation from such authorities as Tarr, C. W. Hayes, J. W. Powell, Adams, Wright, R. T. Hill, Keane, and some of the publications of the Bureau of American Republics. The essay draws attention to all the more important physiographic features of our varied topography, and especially to those that have or have had a bearing on the distribution of American plants.

The selection of material for the second chapter on the climate of North America (pp. 130-165) presents some interesting sidelights on the author's point of view, and his conception of what are the chief climatic factors in the distribution of plants. After a rehearsal of the main climatic features and of some of the general principles of climatology, the book takes up the continental divisions in more detail. This is elaborated mostly from the reports of the United States Weather Bureau, and is as comprehensive, along certain lines, as the most critical could desire. The thing that strikes the curious note is the absolute failure to record any of the conclusions of Abbe on the relation between climate and crops, published in 1905, and which have revolutionized our ideas as to the effects of temperature on plant distribution. That maximum and minimum temperature, and that any method of reckoning accumulative temperature or heat units, are not the vital factors in this problem, has been discussed at length in numerous papers within the last three or four years. And the almost general consensus of opinion that the length of the growing season is the most important factor seems to have escaped the writer's notice. This is much to be regretted, as charts or tables for small areas, such as those in recent papers by Shreve, Gleason,

or the reviewer, showing the number of days between the last killing frost of spring and the first one of autumn, would have been, in the case of Dr. Harshberger's vastly greater range, of the utmost possible usefulness in the orientation of our ideas on plant "life-zones" of the North American continent north of the frost line. In connection with the discussion of rainfall, it would have added interest to make some mention of the relative evaporating power of the air over different soils, as this has a very marked bearing on the ultimate amount of water available to the vegetation.

The West Indies and Central America present some difficulties when generalizations are attempted as to their climate. The one important factor, so far as a plant geographer is concerned, is the prevailing northeast trade-wind, as this has a greater effect on the plant distribution than almost any other single agency. Under this section, Dr. Harshberger makes only incidental mention of this wind, but later (pp. 672-704) he ascribes to it a more important position. The times and seasons of the rains in the larger West Indies are controlled by this moisture-laden wind, rolling in from the Atlantic and precipitating its water on windward slopes, leaving the drier southwesterly areas, on most of the islands, all but deserts. Of all this, nothing, in the account of West Indian climatology. Furthermore, in the *Journal of the New York Botanical Garden* for January, 1910, some little account of the temperature and rainfall of Santo Domingo was published, based on carefully kept records for two or more years, but no mention is made of this. Another feature of West Indian climatology that may excite some question, as presented by the writer, is the statement that the typical hurricanes originate in the open Atlantic. Many meteorologists have considered that these destructive storms originate in the Caribbean, just west of the coast of South America, in a gigantic heat vortex, cyclonically filled up by a sudden in-rushing of cooler air.

The third and shortest chapter (4 pages) of this part contains synopses of the most important tabulations as to the number of native and introduced species in North America, brought down as mentioned above, only to 1908.

### III. GEOLOGIC EVOLUTION, THEORETIC CONSIDERATIONS AND STATISTICS ON THE DISTRIBUTION OF NORTH AMERICAN PLANTS.

If the historical factors, climatic, geological, and ethnological, have been the most important in the fixing of the permanent complexion of our vegetation, then this part of the book will doubtless be considered as of chief interest, for it deals with the most fascinating part of the origin and development of the North American flora. To the botanist, or even to the intelligent general reader, Dr. Harshberger has presented, almost dramatically, a picture of the beginnings of things floral on this continent, that will perhaps evoke criticism, but must meet with general admiration. The alternate rising and falling of the earth's crust, the encroachment of inland oceans over what is now dry land, the upheavals of our great mountain chains, the advance and recession of the continental glaciers, and many other minor geological phenomena, have had profound and fundamental influences on the migration of whole floras, the creation of interesting endemisms, and the struggle between heat- and cold-resisting floras.

The Cretaceous and Tertiary floras are first discussed (pp. 120-182), and a general review of the fossil-bearing strata, together with a list of the better known preglacial plants, is given. This list, to the botanist, will convey a very fair idea of the state of North American vegetation just before the beginning of the southward extension of the great continental glacier; and it serves also to fix in one's mind the vast climatic significance of the encroaching ice-sheet. That such genera as *Anona*, *Araucaria*, *Artocarpus*, *Bombax*, *Casuarina*, *Dalbergia*, *Eugenia*, *Inga*, *Grewia*, *Sabal*, and *Sterculia* should ever have flourished in what is now temperate America is evidence of the far-reaching change wrought by the ice.

The second chapter (pp. 182-203) deals with the development of the flora during the glacial periods, and calls attention to the facts of the alternate encroachment and recession of the glaciers and of the consequent see-sawing of heat- and cold-resistant types of plant life. The treatment of the endemisms created by the final recession of the glacier and of the formation of

glacial bogs, is well written and the author gives frequent acknowledgment to the excellent work of Transeau on this interesting problem.

In the third and longest chapter (pp. 203-311) of this part, the post-glacial and recent history of the North American flora is traced with some detail. That this part of the work, dealing with the forces that finally shaped our present condition of things floristic, should contain even a few errors or omissions is unfortunate. Attention should especially be called to the fact that south of the terminal moraine on Long Island the region is mostly Tertiary, and even more modern in formation, and not Cretaceous.\*

In the consideration of the strand flora of New Jersey, which Dr. Harshberger has studied in some detail, he makes the statement that *Hibiscus moscheutos* followed the shore line of the old Penausken Sound, and that this circumstance explains the occurrence of this maritime plant in the middle of New Jersey. The explanation is ingenious enough, but it does not easily overcome the fact that near Spotswood, N. J., which is almost directly in the middle of the bed of Penausken Sound, the plant is thoroughly established.†

Lack of space forbids mention of many things discussed in this part of the work, although they are of surpassing interest to the phytogeographer and ecologist. It is enough to say that the writer takes up each section of the continent, and gives what he considers to have been the final adjustments of the flora to its environment, and tells us what, to him, have been the underlying factors in the development of the ultimate floristic characteristics of the country.

Such minor inaccuracies as the statement (pp. 276 and 621) that *Crossosoma* is confined, for the most part, to the Californian islands, when really there are at least two other species on the

\* This error occurs throughout the work. See pp. 218 and 421. According to geological survey maps, the only outcroppings of Cretaceous on Long Island are a few small ones on the north shore, near the western end of the island.

† Dr. Harshberger makes no mention of the interesting and suggestive observations of Harper on the relation between the flora of the glaciated and unglaciated region along the Atlantic coast.



continent, and that *Artemesia tridentata* is of the "senecoid composites" (p. 188), instead of being in the tribe Anthemideae, do not necessarily detract from the usefulness of the work, for these are questions of taxonomy, and not details that one must expect every phytogeographer to record with unerring accuracy.

After describing, in chapter four (pp. 311-341), the affinities of the North American flora, comparing each of the sections with neighboring regions,\* or those further removed that have contributed floral elements, the author takes up, in the fifth chapter, the classification of North American phytogeographic regions. Citing among others, those previously published by Grisebach, Engler, Drude, Merriam (whose classification, by the way, was as much zoölogical as botanical), and Clements, with the statement that Engler's classification of 1902, seems to the author "the most complete and satisfactory," Dr. Harshberger writes thus: "The classification presented herewith (his own) represents, the writer believes, the present status of our knowledge concerning the geographic distribution of American plants. In it is incorporated all that is good in the classifications that have preceded, without sacrificing originality."

IV. NORTH AMERICAN PHYTOGEOGRAPHIC REGIONS, FORMATIONS, ASSOCIATIONS. The fourth and much the longest part of this work is taken up with a particular description of the vegetation as it is to-day and as it impresses the author. There are many who will cherish the thought that this enormous amount of labor (pp. 347-704) might well have been left to form the nucleus of another book. And this, not only because the minute description of plant formations and associations is as much ecological as phytogeographic, but also because of the vast amount of more or less stereotypic repetition that must ensue in the description of closely related areas which differ only in minor details; a repetition almost wearisome, in a book of this character, but interesting enough in a sketch of more or less limited areas, or a small series of them. The account of the vegetation of the Arctic tundra and of the peculiar formations of Alaska, Labrador,

\* The citing of *Phyllospadix* of the Zosteraceae, on page 313, as an example of endemism, under arctic algae, is an unhappy slip of the pen.

and Hudson Bay regions is valuable; but he must be an ardent believer who can, with complete mental composure, read a description of the lake, swamp, bog, coniferous forest, and deciduous forest formations each seven or more times, the salt marsh, alpine, barren, strand, and dune formations each five times all in the second and third chapters (pp. 360–516), dealing with the vegetation east of the Mississippi and some of its tributaries. Add to this dozens of minor formations, scores of associations, areas, circum-areas, etc., and the indigestibility of the whole mass may be imagined. Granting, however, the suitability of this vast bulk of minutiae in a work on North American phytogeography, the problem has been handled with as much skill, at least as to form, as the almost hopeless nature of the task would permit.

Some statements challenge attention in this part, as, for instance, the assertion (p. 372) that *Drosera rotundifolia*, *Prunus pennsylvanica*, and *Fragaria virginiana* are true alpine plants, that *Opuntia Rafinesquii* is found on Nantucket (p. 380), that *Clintonia borealis* is a bog plant (p. 385), that *Potamogeton Vaseyi* and *Spirillus* are truly Laurentian\* in distribution (p. 392), that *Sassafras* is typically pine-barren (p. 415), and, most important of all, the statement (p. 481) that in West Virginia there is a series of ponds and lakes which represent water-filled kettle-holes of glacial origin!

The third and fourth chapters of this part continue, with a nearly similar completeness, the description of the vegetation stretching to the Pacific Coast, including the Californian islands. Chapter five considers the Mexican subtropic zone and mountain region, and chapter six, the tropical Mexican and Central American regions. The last four chapters (pp. 516–672) are necessarily briefer than those dealing with better known regions, but they give a valuable account of their respective areas as we know them to-day. While it is true that our knowledge of the West Indian region is still somewhat limited, we should have expected Dr. Harshberger to have availed himself more fully

\* Both are found within the Laurentian area, but neither is typical of this area, as they are both found far south of it. The citation of *Potamogeton* distribution as indicative of or resulting from any particular formation, is open to question, as most aquatics may be found far from what is their conjectural center of distribution, and for obvious reasons.

in chapter seven (pp. 672-704) of the results of the extensive explorations, in nearly every West Indian island, by various members of the staff of the New York Botanical Garden.

So much for a very meager record of the most important phytogeographical work that has appeared in this country. If the review seems to be little more than a catalog of errors and omissions, it must be stated that only the more important errors of fact have claimed attention, and that scores of minor inaccuracies have been glossed over owing to lack of space.

In the recently issued first part of a history of botany by E. L. Greene, we have become familiar with a style of writing that has set a high literary ideal for all future botanical works in this country. The warmest admirer of the present book can never, unfortunately, claim for it consideration as a piece of literature. Note for example the following quotation, exactly copied as to punctuation and wording. "For facility in treatment and also for the purpose of classification the following broad arrangement will be followed in presenting the historic facts which concern this chapter with the following broad classification of material according to geography:" . . . (p. 1). Besides the two pages of corrections published in the beginning of the work, the reviewer has found at least as many more typographical errors that escaped the reader of the proofs. It is perhaps almost impossible to guard against such things in a book written here and printed and edited in Germany.

The eighteen plates are notable contributions to the illustration of North American plants and their habitats, but of the thirty-two text figures, thirteen are from *Die Natürlichen Pflanzenfamilien* or *Das Pflanzenreich*, and lack altogether phytogeographical or ecological significance. The rest are from photographs and much more valuable.

A very complete index of plants (pp. 704-790) is most useful, but a similarly complete index of localities, formations, associations, etc., and of persons would have been of the greatest utility.

In conclusion, the book may be said to be of far-reaching usefulness in that it attempts what no other work has heretofore attempted. That it will fill a long felt want is a foregone conclusion.

NORMAN TAYLOR